

A UNITED STATES
DEPARTMENT OF
COMMERCE
PUBLICATION



NBS Voluntary Product Standard

PS 46-71

Flame-Resistant Paper and Paperboard

A Voluntary Standard
Developed by Producers,
Distributors, and Users
With the Cooperation of the
National Bureau of Standards

U.S.
DEPARTMENT
OF
COMMERCE

National
Bureau
of Standards

UNITED STATES DEPARTMENT OF COMMERCE

Maurice H. Stans, *Secretary*

NATIONAL BUREAU OF STANDARDS

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Voluntary Product Standard

PS 46-71

Flame-Resistant Paper and Paperboard

Technical Standards Coordinator: J. W. Eisele

Abstract

This Voluntary Product Standard covers requirements and test methods for flame-resistant paper and paperboard which are 0.060 inch or less thick. Definitions are provided, and a method for identifying products conforming to the standard is given. Two classifications of flame-resistant paper and paperboard are covered: Type I, which is flame-resistant only before water leaching and Type II, which is flame-resistant both before and after water leaching.

Key words: Flame-resistant, paper and paperboard; paper, paperboard, flame-resistant; paperboard, paper, flame-resistant.

Nat. Bur. Stand. (U.S.), Prod. Stand. 46-71, 10 pages (Oct. 1971)
CODEN: XNPSA

For sale by the Superintendent of Documents, U.S. Government Printing Office,
Washington, D.C. 20402. (Order by SD Catalog No. C13.20/2:46-71), Price 10 cents.

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VOLUNTARY PRODUCT STANDARDS

Voluntary Product Standards are standards developed under procedures established by the Department of Commerce (15 CFR Part 10, as amended, May 28, 1970). The standards may include (1) dimensional requirements for standard sizes and types of various products, (2) technical requirements, and (3) methods of testing, grading, and marking. The objective of a *Voluntary Product Standard* is to establish requirements which are in accordance with the principal demands of the industry and, at the same time, are not contrary to the public interest.

Development of a VOLUNTARY PRODUCT STANDARD

The Office of Engineering Standards Services of the National Bureau of Standards has been assigned by the Department of Commerce the responsibility to work closely with scientific and trade associations and organizations, business firms, testing laboratories, and other appropriate groups to develop *Voluntary Product Standards*. The Bureau has the following role in the development process: It (1) provides editorial assistance in the preparation of the standard; (2) supplies such assistance and review as is required to assure the technical soundness of the standard; (3) acts as an unbiased coordinator in the development of the standard; (4) sees that the standard is representative of the views of producers, distributors, and users or consumers; (5) seeks satisfactory adjustment of valid points of disagreement; (6) determines the compliance with the criteria established in the Department's procedures cited above; and (7) publishes the standard. Industry customarily (1) initiates and participates in the development of a standard; (2) provides technical counsel on a standard; and (3) promotes the use of, and support for, the standard. (A group interested in developing a *Voluntary Product Standard* may submit a written request to the Office of Engineering Standards Services, National Bureau of Standards, Washington, D.C. 20234.)

A draft of a proposed standard is developed in consultation with interested trade groups. Subsequently, a Standard Review Committee is established to review the proposed standard. The committee, appropriately balanced, includes qualified representatives of producers, distributors, and users or consumers of the product being standardized. When the committee approves a proposal, copies are distributed for industry consideration and acceptance. When the acceptances show general industry agreement, and when there is no substantive objection deemed valid by the Bureau, the Bureau announces approval of the *Voluntary Product Standard* and proceeds with its publication.

Use of a VOLUNTARY PRODUCT STANDARD

The adoption and use of a *Voluntary Product Standard* is completely voluntary. *Voluntary Product Standards* have been used most effectively in conjunction with legal documents such as sales contracts, purchase orders, and building codes. When a standard is made part of such a document, compliance with the standard is enforceable by the purchaser or the seller along with other provisions of the document.

Voluntary Product Standards are useful and helpful to purchasers, manufacturers, and distributors. Purchasers may order products that comply with *Voluntary Product Standards* and determine for themselves that their requirements are met. Manufacturers and distributors may refer to the standards in sales catalogs, advertising, invoices, and labels on their product. Commercial inspection and testing programs may also be employed, together with grade labels and certificates assuring compliance, to promote even greater public confidence. Such assurance of compliance promotes better understanding between purchasers and sellers.

Flame-Resistant Paper and Paperboard

Effective June 15, 1971 (See section 6.)

(This Voluntary Product Standard, initiated by the American Paper Institute, has been developed under the *Procedures for the Development of Voluntary Product Standards*, published by the U.S. Department of Commerce, as a revision of CS 203-56, *Flame-Resistant Paper and Paperboard*. See Section 7, *History of Project*, for further information.)

1. PURPOSE

The purpose of this Voluntary Product Standard is to establish nationally recognized requirements for the burning characteristics of flame-resistant paper and paperboard. This Standard is intended to provide producers, distributors, and users with a basis for common understanding of the burning characteristics of flame-resistant paper and paperboard. It is not, however, to be confused with any classification system, standard, or law which pertains to the flammability requirements for items which may be fabricated from these products, nor is it intended to apply to non-woven fabrics.

2. SCOPE AND CLASSIFICATION

2.1. Scope—This Voluntary Product Standard covers requirements and test methods for the burning characteristics of flame-resistant paper and paperboard which are 0.060 inch (1.5 millimeters) or less thick and whose strength will allow the char length test provided for herein to be performed without distortion of the results of the test due to tearing of the specimen rather than to charring. Methods of labeling to identify paper and paperboard that conform to the Standard are provided.

2.2. Classification—The paper and paperboard covered by this Standard are classified by the following two types:

Type I—Paper and paperboard which meet all of the requirements of this Standard before water leaching.

Type II—Paper and paperboard which meet all of the requirements of this Standard both before and after water leaching and subsequent drying.

3. REQUIREMENTS

3.1. General—Products represented as complying with this Voluntary Product Standard shall meet all of the requirements specified herein.

3.2. Burning characteristics—Type I paper and paperboard shall meet the requirements specified in table 1 when tested in accordance with 4.1. Type II paper and paperboard shall meet the requirements specified in table 1 when tested in accordance with 4.1 both before

and after water leaching. The water leaching and subsequent drying shall be accomplished as specified in 4.2.

Table 1. Burning characteristics

Maximum flaming time ^a		Maximum glowing time ^b		Maximum char length ^c	
Average of specimens	Individual specimen	Average of specimens	Individual specimen	Average of specimens	Individual specimen
<i>seconds</i>	<i>seconds</i>	<i>seconds</i>	<i>seconds</i>	<i>inches</i>	<i>inches</i>
2.0	2.5	2.0	5.0	4.5	5.5

^a Flaming time—The time the specimen continues to flame after the burner flame is removed.

^b Glowing time—The time the specimen continues to glow after it has ceased to flame.

^c Char length—The height of the void area of the specimen resulting from the breaking out of the material charred during testing, measured from the bottom edge of the specimen and reported to the nearest 1/10 inch.

4. TEST PROCEDURES

4.1. Burning characteristics—Except that the procedures for determining char length shall be as specified in 4.1.1, the burning characteristics shall be determined by using the apparatus, test specimens, and test procedures described in the Technical Association of the Pulp and Paper Industry (TAPPI) standard T461 os-68, *Flame Resistance of Treated Paper and Paperboard*.¹ The test specimens shall be conditioned in accordance with TAPPI standard T402 os-70, *Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products*.¹

4.1.1. Char length—Remove the test specimen from the specimen holder and attach two clips,² each 12.5 ± 0.5 grams, to the bottom of the specimen, one on each side of the burned area, at equal distances from a line which is perpendicular to the base of the specimen and which passes through the point of apparent maximum burn height. Hold the specimen over a 6-millimeter-diameter glass or metal rod so that the bottom of the test specimen is even with the top of the rod and the rod is extending perpendicular to the plane of the specimen. Center the burned area of the test specimen over the rod as shown in figure 1. Drop the specimen on the rod, thus breaking out the charred material at the apex of the burned area.

4.2. Water leaching—Place the specimens in a 2-liter beaker. Fill the beaker with de-ionized or distilled water having a maximum conductivity of 5 micro-mhos per centimeter and a temperature of 75 ± 2 °F (24 ± 1 °C). Add additional water meeting the same requirements through a 1/4-inch (6.35 millimeters)—inside diameter glass tube which extends to the bottom of the beaker. The water shall be added at a rate of 12 liters per hour for 4 hours. At the end of 4 hours, remove the specimens, blot them on absorbent paper toweling, and dry them in an oven at 221 °F (105 °C).

¹ Later issues of TAPPI publications may be used providing the requirements are equivalent to those specified in the issue designated. Copies of TAPPI publications are obtainable from the Technical Association of the Pulp and Paper Industry, 360 Lexington Avenue, New York, N. Y. 10017.

² Esterbrook clip No. 10 has been found suitable for this purpose.

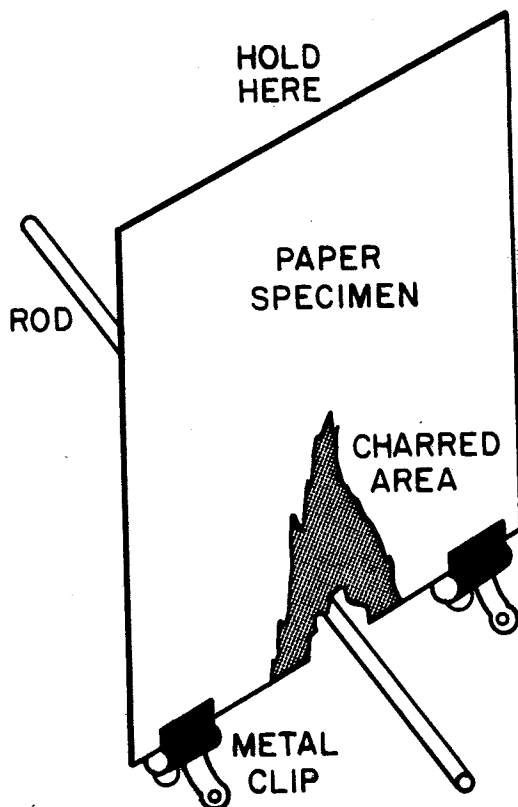


FIGURE 1. Testing for char length.

5. IDENTIFICATION

In order that purchasers may identify products conforming to all requirements of this Voluntary Product Standard, producers and distributors may include a statement of compliance in conjunction with their name and address on product labels, invoices, sales literature, and the like. The following statement is suggested when sufficient space is available:

This Type _____ flame-resistant paper (paperboard) conforms to all of the requirements established in Voluntary Product Standard PS 46-71, developed cooperatively with the industry and published by the National Bureau of Standards under the *Procedures for the Development of Voluntary Product Standards* of the U.S. Department of Commerce. Full responsibility for the conformance of this product to the standard is assumed by (name and address of producer or distributor).

The following abbreviated statement is suggested when available space on labels is insufficient for the full statement:

Conforms to PS 46-71, Type _____, (name and address of producer or distributor).

6. EFFECTIVE DATE

The effective date of this Voluntary Product Standard is the date upon which reference to the Standard may be made by producers, distributors, users and consumers, and other interested parties. Compliance by producers with all of the requirements of this Voluntary Product Standard may not actually occur until some time after its effective date. Products shall not be represented as conforming to this Voluntary Product Standard until such time as all requirements established in the Standard are met. The effective date of this Standard is June 15, 1971.

7. HISTORY OF PROJECT

In May 1969, at the request of The Kraft & Packaging Papers Division of the American Paper Institute, a revision to Commercial Standard CS 203-56, *Flame-Resistant Paper and Paperboard*, was initiated to add requirements and test methods for flame-resistant paper and paperboard which maintain their flame-resistance properties after water leaching, and to revise the test for char length. With the assistance of the reconstituted Standing Committee and based on recommendations of producers, distributors, and users of flame-resistant paper and paperboard, a recommended revision was developed in the format of a new Voluntary Product Standard. The recommended Standard was circulated for acceptance in February 1971, and the response to that circulation indicated that a consensus of acceptability, as defined in the *Procedures for the Development of Voluntary Product Standards*, existed within the industry.

On May 25, 1971, the Voluntary Product Standard designated PS 46-71, *Flame-Resistant Paper and Paperboard*, was approved for publication by the National Bureau of Standards, to be effective June 15, 1971.

Technical Standards Coordinator:

J. W. Eisele, Office of Engineering Standards Services, National Bureau of Standards, Washington, D.C. 20234.

8. STANDING COMMITTEE

The individuals whose names are listed below constitute the membership of the Standing Committee for this Standard. The function of the committee is to review all proposed revisions and amendments in order to keep this Standard up to date. Comments concerning this Standard and suggestions for its revision may be addressed to any member of the committee or to the Office of Engineering Standards Services, National Bureau of Standards, Washington, D.C. 20234, which acts as secretary for the committee.

Representing Producer-Distributors

Mr. Henry C. Crandall (Chairman), Mosinee Paper Mills Company, Mosinee, Wisconsin 54455

Mr. Robert W. Nelson, St. Regis Paper Company, Laminated and Coated Products Division, 55 Starkey Avenue, Attleboro, Massachusetts 02703

Mr. Richard V. Soderberg, Hoerner Waldorf Corporation, P.O. Box 3260, St. Paul, Minnesota 55101

Mr. Robert H. Lace, Fox Paper Company, Box 15099, Cincinnati, Ohio 45215
 Mr. Donald J. Goodman, Sorg Paper Company, 901 Manchester Avenue, Middletown, Ohio 45042
 Mr. Stuart Dalheim, Technical Paper Division, Mead Corporation, Willow Street, South Lee, Massachusetts 01260

Representing Consumer-Users

Mr. Chester J. McDonald, Compac Corporation, Old Flanders Road, Netcong, New Jersey 07857
 Mr. Ellsworth L. Smith, Johns Manville Fiberglass Research Center, Waterville, Ohio 43566
 Mr. A. T. Haltiwanger, U.S. Pipe & Foundry Company, 4200 Huntsville Road, P.O. Box 2651, Birmingham, Alabama 35202
 Mr. Walter B. Kennedy, Union Camp Corporation, 1600 Valley Road, Wayne, New Jersey 07470
 Mr. Harland E. Fargo, Owens-Corning Fiberglass Corporation, Granville Technical Center, Granville, Ohio 43023
 Mr. W. M. Jason, Bemiss-Jason Corporation, 3250 Ash Street, Palo Alto, California 94306

Representing General Interests

Mr. Herbert W. Eickner, Fire Research Section, U.S. Forest Products Laboratory, P.O. Box 5130, Madison, Wisconsin 53705

9. ACCEPTORS

The producers, distributors, users, and others listed below have individually indicated in writing their acceptance of this Voluntary Product Standard prior to its publication. The acceptors have indicated their intention to use this Standard as far as practicable but reserve the right to depart from it when necessary. The list is published to show the extent of recorded public support for this Standard.

ASSOCIATIONS

American Paper Institute, New York, New York
 Fibre Box Association, Chicago, Illinois
 Technical Association of the Pulp and Paper Institute, New York, New York

PRODUCERS

Bemiss-Jason Corporation, Palo Alto, California
 Blessings, Inc., Bound Brook, New Jersey
 Carborundum Company, The, Niagara Falls, New York
 Champion Paper Products Company, Union, New Jersey
 Clopay Corporation, Augusta, Kentucky
 Container Corporation of America, Carol Stream, Illinois
 Cottrell Paper Company, Inc., Rock City Falls, New York
 Edgewater Paper Company, Menasha, Wisconsin
 Erving Paper Mills, Erving, Massachusetts
 Fitchburg Paper Company, Fitchburg, Massachusetts
 Fortifiber Corporation, Los Angeles, California
 Fox Paper Company, Lockland, Ohio
 Hamilton Manufacturing Company, Inc., Richmond, Virginia
 Hexcel Corporation, Dublin, California
 Hoerner Waldorf Corporation, St. Paul, Minnesota
 Hollingsworth and Vose Company, East Walpole, Massachusetts
 Johns-Manville Products Corporation, Manville, New Jersey
 Latex Fiber Industries, Inc., Beaver Falls, New York
 Ludlow Corporation, Needham Heights, Massachusetts
 Mosinee Paper Corporation, Mosinee, Wisconsin
 Nicolet Industries, Inc., Ambler, Pennsylvania
 Pacific Resins and Chemicals, Newark, Ohio
 Panacorp Corporation, Cincinnati, Ohio
 Riegel Paper Corporation, New York, New York
 Rogers Corporation, Rogers, Connecticut
 St. Regis Paper Company, Attleboro, Massachusetts
 Sorg Paper Company, Middletown, Ohio
 Sterling Disposables, Ltd., Brooklyn, New York
 Thilmann Pulp and Paper Company, Kaukauna, Wisconsin
 U.S. Gypsum Research Center, Des Plaines, Illinois
 U.S. Pipe and Foundry Company, Birmingham, Alabama
 Westvaco, Williamsport, Pennsylvania
 Weyerhaeuser Company, Fitchburg, Massachusetts

DISTRIBUTORS

Montrose Paper Mills, Chicago, Illinois
National Industrial Laundries, Elizabeth,
New Jersey
Newberry, J. J., New York, New York

New London Tape District, Inc., Niantic,
Connecticut
Noland Paper Company, Inc., Buena Park,
California

USERS

B. F. Goodrich Company, Troy, Ohio
Cleveland Fabricating Company, The, Cleve-
land, Ohio
Compac Corporation, Netcong, New Jersey
Industrial Products Company, Inc., Mt.
Pleasant, Tennessee
Johns-Manville Fiber Glass, Waterville, Ohio
Kable Printing Company, Mt. Morris, Il-
linois
Lydall, Inc., Manchester, Connecticut

Niemand Brothers, Inc., Elmhurst, New
York
Owens/Corning Fiberglas Corporation, Gran-
ville, Ohio
Precept, Inc., Euless, Texas
Susquehanna Corporation, The, Pueblo,
Colorado
Union Camp Corporation, Wayne, New
Jersey
United States Mineral Products Company,
Stanhope, New Jersey

GENERAL INTEREST

Cavedon Chemical Company, Inc., Woon-
socket, Rhode Island
Chicago Paper Testing Laboratory, Chicago,
Illinois
Foster, R. N., Cambridge, Massachusetts
Fox Valley Corporation, Appleton, Wis-
consin
George, S., Company, Wellsburg, West Vir-
ginia
Hopta, Michael, Newark, New Jersey
Lowndes Products, Inc., Easley, South Caro-
lina

Macy, R. H., Company, Inc., New York,
New York
Mellon, Ibert, Flushing, New York
Plaskett, Clyde, Wheaton, Illinois
Syracuse University, College of Forestry,
Syracuse, New York
United States Testing Company, Inc., Hobo-
ken, New Jersey
Wyandotte Corporation, South Kearny, New
Jersey

FEDERAL GOVERNMENT

Defense Personnel Support Center, Phila-
delphia, Pennsylvania
Food and Drug Administration, Washington,
D.C.
General Services Administration, Washing-
ton, D.C.
National Institutes of Health, Bethesda,
Maryland

U.S. Department of Agriculture, Office of
Plant and Operation, Washington, D.C.
U.S. Department of Agriculture, Packaging
and Investigations, Hyattsville, Maryland
U.S. Department of Health, Education, and
Welfare, Rockville, Maryland

STATE AND LOCAL GOVERNMENTS

Bureau of Standards, Department of Prop-
erty and Supplies, Harrisburg, Pennsyl-
vania
District of Columbia, Government of the,
Bureau of Procurement, Washington, D.C.

Hawaii, State of, Department of Account-
ing and General Services, Honolulu,
Hawaii

TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance of a Voluntary Product Standard and its significance:

1. *Enforcement*—Voluntary Product Standards contain requirements which are established by mutual consent of those concerned in accordance with the *Procedures for the Development of Voluntary Product Standards* published by the Department of Commerce (15 CFR Part 10, as amended, May 28, 1970). The standards provide a common basis of understanding among producers, distributors, and users or consumers. The National Bureau of Standards has no regulatory power in the enforcement of the provisions of voluntary standards, but since these standards represent the will of the interested groups as a whole, their provisions soon become established as trade customs and become effective when the standards are referenced in sales contracts, procurement specifications, government regulations, and the like.

2. *The Responsibility of the Acceptor*—The purpose of Voluntary Product Standards is to establish, for specific items, nationally recognized sizes, grades, material requirements, or performance criteria. The benefits that result from these standards will be in direct proportion to general recognition and actual use of the standards. Instances will occur when it may be necessary to deviate from a standard. The signing of an acceptance does not preclude such departures. The acceptor's signature, however, indicates an intention to follow the standard, where practicable, in the production, distribution, or use and consumption of the product in question.

ACCEPTANCE OF VOLUNTARY PRODUCT STANDARD

PS 46-71, FLAME-RESISTANT PAPER AND PAPERBOARD

This form properly completed, signed, and returned will show your acceptance of this *Voluntary Product Standard*.

Date_____

Office of Engineering Standards Services
National Bureau of Standards
U.S. Department of Commerce
Washington, D.C. 20234

Gentlemen:

We are primarily engaged in the following segment of the industry:

(Please check only one.)

- | | |
|---------------------------------------|---|
| <input type="checkbox"/> Production | <input type="checkbox"/> Use/consumption |
| <input type="checkbox"/> Distribution | <input type="checkbox"/> General Interest |

We believe that this *Voluntary Product Standard* constitutes a useful standard of practice, and we plan to use it as far as practicable. *However*, we reserve the right to depart from the standard as we deem advisable.

We understand, of course, that only those products which actually conform to the standard in all respects may be represented as conforming thereto.

Signature of authorized officer _____

(Please type or print the following.)

Name and title of above officer _____

Organization _____

(Fill in exactly as it should be listed.)

Street Address _____

City, State, and ZIP Code _____

(Note: Separate acceptances should be filed for each subsidiary company and affiliate which is to be listed as an acceptor.)

(Cut on this line)

NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards¹ was established by an act of Congress March 3, 1901. The Bureau's overall goal is to strengthen and advance the Nation's science and technology and facilitate their effective application for public benefit. To this end, the Bureau conducts research and provides: (1) a basis for the Nation's physical measurement system, (2) scientific and technological services for industry and government, (3) a technical basis for equity in trade, and (4) technical services to promote public safety. The Bureau consists of the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, the Center for Computer Sciences and Technology, and the Office for Information Programs.

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¹ Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.

² Part of the Center for Radiation Research.

³ Located at Boulder, Colorado 80302.

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NBS Special Publication 305, Supplement 1, Publications of the NBS, 1968-1969. When ordering, include Catalog No. C13.10:305. Price \$4.50; \$1.25 additional for foreign mailing.